Chapter 4: Air and Odor

This chapter addresses three aspects of air quality: 1) criteria pollutants, which are air pollutants for which federal, state, or local agencies have established ambient air quality standards; 2) toxic air compounds (TACs), which are air pollutants that have known, or suspected, human health effects but for which no air quality standards have been established; and 3) odor. The chapter describes the potential for affecting air and odor at the Cedar Hills Regional Landfill (CHRLF) by implementing any of the alternatives.
This environmental review determined that no significant unavoidable adverse impacts to air quality, including odor, are anticipated during construction or operation of any of the alternatives.

4.1 Affected Environment

Air quality is potentially impacted by operations at the CHRLF. Evaluation of the affected environment for air quality considers fugitive dust and other pollutants from operation of equipment on the landfill, erosion, vehicle emissions, and landfill gas flares; TACs from landfill gas and leachate; and potential odors from fugitive landfill gas emissions, leachate lagoons, and daily operations on the active face of the landfill.

Air quality is regulated through several agencies. The federal Clean Air Act regulates criteria pollutants and TACs, while odor is regulated through county code and local air quality regulations. Regulations for criteria pollutants are implemented by the Puget Sound Clean Air Agency (PSCAA) and include standards for six air quality parameters, such as particulate matter and carbon monoxide. These standards are national and are established to protect human health. Regulations for TACs, also commonly called air toxics or toxic air pollutants, are established on an industry basis and address specific compounds potentially emitted by the industry. The regulations are developed through coordinated efforts between the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and PSCAA. The TAC regulations apply to emissions from the flares at the CHRLF. In addition, under the Title V permit conditions, PSCAA regulates emissions of methane, hydrocarbons, and non-methane organic compounds (NMOCs).

Odor at solid waste facilities is regulated by PSCAA Regulation I and the Code of the King County Board of Health Title 10. Regulation of odor is more of a qualitative evaluation and involves investigation of odor complaints. These regulations prohibit odor that interferes with health and enjoyment of life or property, beyond the facility boundary.

4.1.1 Criteria Pollutants

PSCAA has primary jurisdiction over air quality in King County and authority to implement requirements promulgated by EPA. These agencies have established ambient air quality standards for criteria pollutants that are relevant to the CHRLF, including the following:

- Particulate matter or PM_{10} (particles less than 10 micrometers in mean mass diameter) and fine particulate matter or $PM_{2.5}$ (particles less than 2.5 micrometers in mean mass diameter), which result primarily from fugitive dust produced when trucks and equipment operate on unpaved surfaces and from particulate emissions from engines.

- Sulfur dioxide (SO_2) and nitrogen oxides (NO_x), which are present in landfill gas flare emissions, and in the exhaust from landfill-related vehicles and equipment.
- Carbon monoxide (CO), which is present in combustion devices, or flare emissions and in the exhaust from landfill-related vehicle engines or equipment.

The CHRLF is located within an area designated by the EPA and PSCAA as an attainment zone for all pollutants. This designation is given to areas within which the ambient standards have been met over a period of time.

Sources of Particulate Matter ($PM_{2.5}$ and PM_{10})

Fugitive dust modeling (HDR 2009a; Appendix E3) was conducted to reflect current operations at the CHRLF, as well as to determine the impacts of the facility's $PM_{2.5}$ and PM_{10} emissions. The modeling included fugitive dust generated by haul-truck traffic on-site and on the public roads leading to the CHRLF (HDR 2009e), daily cover operations (including dozers and scrapers), and other traffic on the public roads leading to the CHRLF. The fugitive dust modeling was based on the traffic and landfill sources operating between the hours of 5:00 a.m. and 9:00 p.m. The public roads traffic information was based on a traffic survey performed during a period between June 9 and June 18, 2009, at three intersections near the facility.

Meteorological data, such as wind, humidity, and temperature, were also input to the model. Although high-wind events may increase fugitive dust, peak modeled particulate concentrations typically occur during low-wind events, when atmospheric dilution is poorest.

The model provided results for receptors along the CHRLF's property line and at nearby residences, as shown in Figure 4-1. The highest concentration at any receptor for a given averaging period was used to calculate emissions for comparison to the applicable ambient air quality standards.

Based on the model, the peak 24-hour PM_{10} concentration associated with existing operations was computed to be 32 $\mu g/m^3$, well below the 24-hour PM_{10} ambient air quality standard of 150 $\mu g/m^3$. The peak 24-hour and annual $PM_{2.5}$ concentrations associated with existing conditions were computed to be 2 $\mu g/m^3$ and 0.6 $\mu g/m^3$, respectively, well below the 24-hour and annual $PM_{2.5}$ ambient air quality standards of 35 $\mu g/m^3$ and 15.0 $\mu g/m^3$, respectively.

Sources of Other Criteria Pollutants

Currently, PSCAA requires annual testing of flare emissions from the CHRLF for NO_x, SO_2, CO, and a variety of hydrocarbons (HC). When the new Bio Energy (Washington), LLC landfill gas processing facility becomes fully operational, PSCAA may modify or eliminate flare emissions testing. The purpose of these emissions tests is to provide PSCAA with information concerning the type and relative magnitude of air contaminant emissions in the four-county area within its jurisdiction. PSCAA has not issued any notices of violation or indicated any concern about the contribution of flare emissions from the CHRLF to the attainment status of any criteria pollutant.

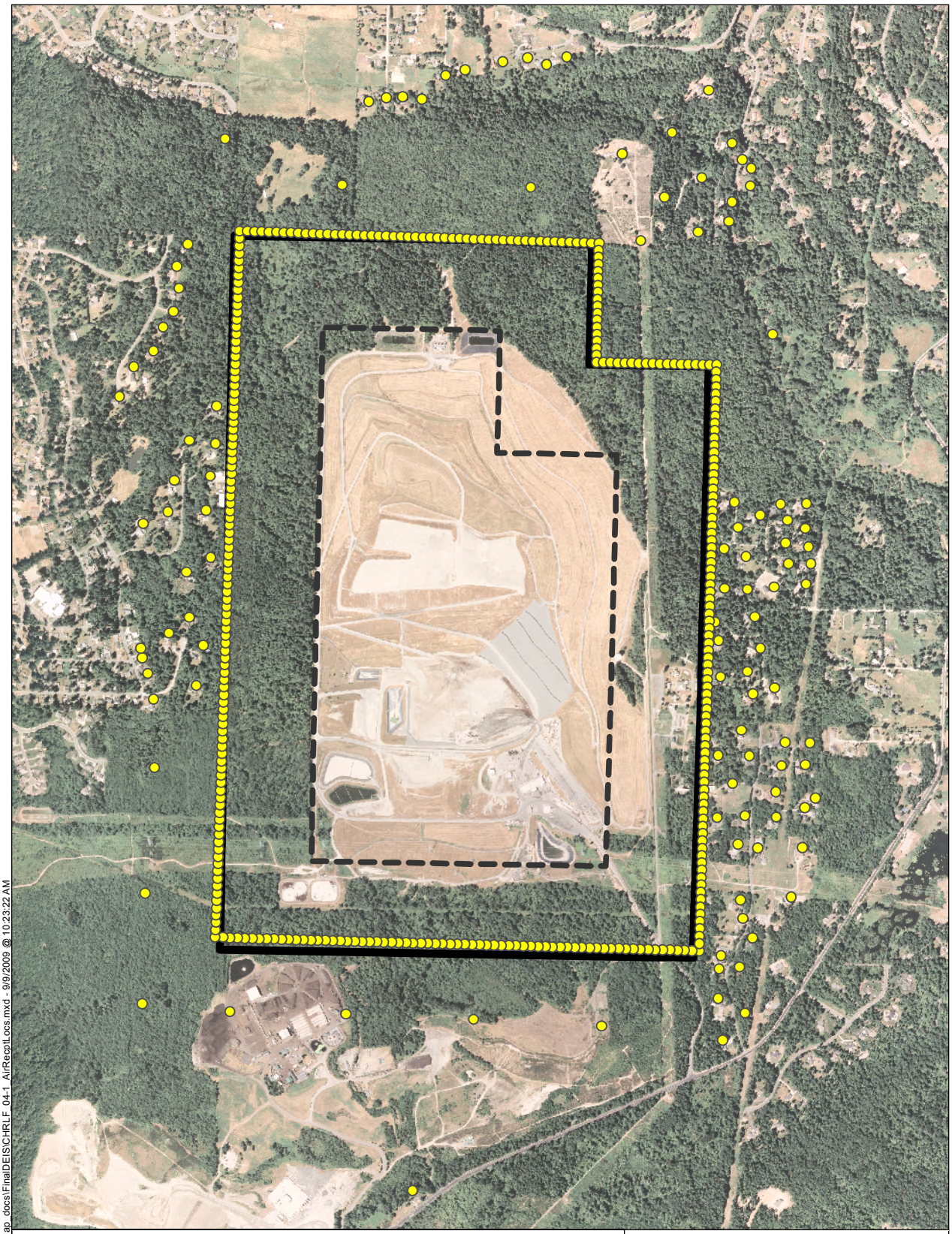

FIGURE 4-1
Fugitive Dust Modeling Receptor Locations

CO from CHRLF-related traffic and equipment is not of concern, because it represents only a small contribution to regional CO levels. CO levels are a primary concern at congested intersections in urban and suburban areas. As discussed in the transportation section (Chapter 13), traffic associated with current and continued operation of the CHRLF would cause no significant difference in traffic conditions. Background traffic would cause congestion on the transportation network in the site vicinity with or without the CHRLF.

NO_x and HCs in flare emissions, and HCs in fugitive emissions of landfill gas, could contribute to ozone formation. However, ozone formation is a regional issue that is dealt with on a policy level by EPA, Ecology, and PSCAA. As with CO, these pollutants are not of concern, because they represent only a small contribution to regional levels.

On March 12, 1996, EPA issued performance standards for control of emissions from municipal solid waste landfills (CFR 1996). Compliance with these standards, which are discussed in more detail in the impacts section below, has reduced the CHRLF's emissions of NO_x and HCs that can contribute to ozone production.

4.1.2 Toxic Air Compounds

Landfill gas contains trace quantities of TACs, which at high enough concentrations can pose a risk to human health. The State of Washington regulates sources of such compounds through WAC 173-460 (Controls for New Sources of Toxic Air Pollutants); PSCAA enforces WAC 173-460 through Regulation III. WAC 173-460 specifies Acceptable Source Impact Levels (ASILs) for TACs. An ASIL is a concentration of a TAC in the outdoor atmosphere in any area that does not have restricted or controlled public access. It is used to evaluate the air quality impacts of a single source.

One potential source of TACs is landfill gas, which is generated during the natural process of bacterial decomposition of organic material in a landfill. The quantity and components of landfill gas are a function of the types and ages of the waste, the quantity and types of organic compounds in the waste, and the moisture and temperature of the waste (EPA 2008). Another potential source of TAC emissions at the CHRLF is aeration of the leachate lagoons.

By volume, landfill gas is about 50 percent methane and 50 percent carbon dioxide and water vapor. Landfill gas also contains small amounts of nitrogen, oxygen, hydrogen, NMOCs, and trace amounts of inorganic compounds, some of which have strong, pungent odors. The NMOCs may consist of hazardous air pollutants and volatile organic compounds, which can cause adverse health effects. Flaring or combustion in an engine substantially reduces emissions of NMOCs and methane.

A TAC evaluation (HDR 2009b) for the landfill was conducted for the existing conditions. This evaluation included a determination of the modeled impacts of that portion of the landfill gas not collected by the CHRLF's landfill gas collection system (i.e., fugitive landfill gas) as well as estimated emissions from the leachate lagoons.

The results of sample analyses of landfill gas and leachate from the CHRLF were used in the TAC and dispersion modeling to estimate the ambient impact of those emissions. Four chemicals with ASILs were not included in the landfill gas tests, but have landfill gas concentration estimates listed in the EPA document, *Compilation of Air Pollutant Emission Factors*, AP-42 (Section 2.4, November 1998): butane, ethanol, ethyl mercaptan, and

pentane. The average landfill gas concentrations listed in AP-42 were used for these chemicals to supplement the measured chemicals in the CHRLF landfill gas tests. The dispersion modeling was performed using the same model and meteorological data as were used in the fugitive dust analysis.

The fugitive landfill gas emissions were estimated using EPA's LandGEM model (version 2.0), historical waste placed information, and future projected waste placed data. Unit emission rates were modeled for each source of TACs included in the modeling, and the results were processed using spreadsheets to determine the maximum expected ambient impact for each TAC. As a note, the fugitive landfill gas emissions for existing conditions correspond to those estimated by LandGEM for the year 2019, the year following estimated closure if none of the five action alternatives is implemented. The LandGEM calculation methodology results in maximum landfill gas emissions the year following closure.

Further, the collection efficiency was assumed to be 85 percent for the oldest portions of the landfill (through Area 4) and 90 percent for Areas 5-7. The fugitive landfill gas emissions of older areas and Areas 5-7 were modeled as separate sources.

Based on scoping comments, an analysis of emissions from the leachate lagoons was conducted using historical data from routine sampling of the leachate that is collected and sent to the leachate lagoons (influent), as well as the aerated leachate that is pumped to the sanitary sewer system (effluent) for treatment. The samples were analyzed to determine the concentrations of several compounds, a number of which are classified as TACs. The sampling results were reviewed and those compounds that are TACs were identified for evaluation. EPA-approved dispersion modeling was performed to estimate TAC concentrations that may cause odor or potential health impacts. The modeling results indicate that concentrations of all TACs were below the ASILs.

4.1.3 Odor

PSCAA and Public Health – Seattle & King County (Public Health) are the primary regulatory agencies for odors.

There are at least two major potential sources of odor in the vicinity of the landfill area: the CHRLF and the privately owned and operated Cedar Grove Composting facility located southwest of the CHRLF. Odor potential at the CHRLF is associated with three possible sources: 1) fugitive landfill gas emissions; 2) leachate lagoons; and 3) fresh garbage in the active face area.

Some of the compounds found in landfill gas can contribute to odor; however, the number of chemical compounds present, the complexity of chemical processes in the atmosphere, and the limitations of the human olfactory system, can make it difficult to identify and quantify the compounds causing the odor. Therefore, unlike criteria pollutants, there are no ambient air quality standards for odorous compounds, although some compounds are measured and regulated as TACs (as discussed in Section 4.1.2). Generally, odors are regulated and mitigated at the landfill through a multi-faceted odor management program.

PSCAA regulates odorous emissions through section 9.11 of Regulation I (emission of air contaminant: detriment to person or property). Part (a) of the regulation states:

> It shall be unlawful to cause or permit the emission of an air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.

Under PSCAA, after receiving complaints of odor, a PSCAA inspector visits the area when the odor is present. At the inspector's discretion, a notice of violation can be issued to the owner or operator of the odor source.

Public Health regulates nuisance odors at solid waste facilities including landfills and landfill-related facilities, such as vehicles, containers, tanks, and surface impoundments. Requirements for odor control are contained in Public Health's Solid Waste Regulations (Code of the King County Board of Health, Title 10). A nuisance odor is defined as any odor which is found offensive or that may unreasonably interfere with any person's health, comfort, or enjoyment beyond the property boundary of a facility.

Odor History in the Site Vicinity

In the early 1980s, KCSWD installed an active landfill gas management system at the CHRLF to manage gas and control odors. The gas management system collects, transmits, and treats landfill gas in compliance with existing regulations. KCSWD employs best management and engineering practices to manage landfilling operations to minimize odor sources to achieve a zero odor and complaint goal. KCSWD has implemented an odor management program that includes the following major activities:

- A Complaint Response Plan (Odor, Fugitive Dust, and Nuisance) for the CHRLF has been in effect since 2000, and commits KCSWD to respond rapidly with specific actions and time frames. This plan is included as Appendix F.
- All neighbors within 3.2 miles of the CHRLF have been made aware of the formal Complaint Response Plan.
- A complaint hotline is staffed 24 hours a day to record odor problems reported by site neighbors.
- A regular odor monitoring program is conducted around the perimeter of the CHRLF using the "Nasal Ranger" program developed by St. Croix Sensory, Inc., Lake Elmo, Minnesota. This program involves use of an olfactory meter, or portable odor-measuring device, to quantify odor strength.
- All the gas wells are monitored daily for any gas leakage.

Odor is monitored daily across the surface area and around the perimeter of the landfill, as well as weekly in adjacent neighborhoods. In addition, odors are investigated any time a complaint is received by KCSWD staff. In response to odor complaints, KCSWD staff report to the complainant's location to assess the situation. Any odors are then traced back to the source, corrective measures are taken as necessary, and the complainant is informed of the measures taken. Implementation of these odor management activities has reduced the number of odor complaints to approximately one to two per month. From 2004 to 2009 the CHRLF received 80 complaints related to odor issues (Grant 2010). In each case, a trained

odor monitor from the landfill responded to the complaint and determined that the odor was not characteristic of landfilling operations.

PSCAA also collects odor complaint information by suspected source (Williams 2009). Between 2004 and 2009, PSCAA received 2,348 odor complaints from residents in the area (PSCAA 2009). Of those complaints, PSCAA identified the Cedar Grove Composting facility as the suspected source in 2,320 cases (98.8 percent) and CHRLF as the suspected source in 28 cases (1.2 percent). For 7 of the 28 complaints, PSCAA directed KCSWD to take corrective action; for the remaining 21 complaints, no corrective action was required.

Based on scoping comments, an analysis of emissions from the leachate lagoons was also conducted (discussed in Section 4.1.2; HDR 2009b). The study concluded that emissions from the leachate lagoons are localized and do not contribute to off-site impacts.

To minimize odors from the active landfill face, KCSWD keeps the daily work area of the active face to a minimum and applies a cover to the work area at the conclusion of each day's activities.

4.2 Environmental Impacts

4.2.1 Direct Impacts

Criteria Pollutants

Particulate Matter (PM_{10} and $PM_{2.5}$)

Levels of particulate matter associated with the production of fugitive dust in the worst-case of the five action alternatives and associated air quality impacts in the surrounding community were modeled (HDR 2009a) using the methodology developed for the existing conditions detailed previously.

The future fugitive dust generated by haul-truck traffic on-site and on the public roads leading to the CHRLF was calculated based on a ratio of current CHRLF haul traffic and future combined CHRLF haul traffic and action alternative construction truck traffic. The future fugitive dust generated from daily cover operations (including dozers and scrapers), and other traffic on the public roads leading to the CHRLF, was assumed to be the same as for existing conditions.

The future peak 24-hour PM_{10} concentration was computed to be 53 $\mu g/m^3$ for all of the action alternatives. The average 24-hour background PM_{10} is the average of the 2nd high means for the three years. Summing the future CHRLF modeled value and the background concentration results in a predicted future maximum 24-hour PM_{10} impact of 94 $\mu g/m^3$. This concentration is well below the 24-hour PM_{10} ambient air quality standard of 150 $\mu g/m^3$.

The future peak 24-hour and annual $PM_{2.5}$ concentrations were computed to be 4 $\mu g/m^3$, and 1 $\mu g/m^3$, respectively. Summing the future CHRLF modeled values and the background concentrations results in a predicted future maximum 24-hour $PM_{2.5}$ impact of 19 $\mu g/m^3$ and a maximum predicted future annual $PM_{2.5}$ impact of 6 $\mu g/m^3$. These concentrations are well below the 24-hour and annual $PM_{2.5}$ ambient air quality standards of 35 $\mu g/m^3$and 15 $\mu g/m^3$, respectively.

Other Criteria Pollutants

Other criteria pollutants were not evaluated in detail for this EIS because they were not produced in large enough quantities to cause concern. Furthermore, none of the five action alternatives will cause increases in criteria pollutant emissions in quantities sufficient to cause concern. PSCAA currently does require annual testing of flare emissions from the CHRLF for NO_x, SO_2, CO, and a variety of hydrocarbons. However, as stated previously, when the landfill gas processing facility becomes fully operational, PSCAA may modify or eliminate these annual emission tests for the CHRLF flares.

TACs

A TAC evaluation (HDR 2009a) for the landfill was conducted for the worst-case of the five action alternatives. This evaluation used the same methodology as was used to model the existing conditions. The results of the analysis indicate that landfill operations should be below all WAC and PSCAA ASILs for all alternatives.

Odor

Each of the action alternatives involves excavation of old solid waste from unlined portions of the CHRLF that will require control measures to mitigate potential emissions of landfill gas and odor. In 2004, KCSWD successfully excavated some solid waste from the South Solid Waste Area (SSWA) under a plan approved by Public Health that included intensive air quality monitoring at the excavation site, and there were minimal impacts. During the excavation process, CHRLF staff carefully monitored odor emissions and implemented corrective mitigation measures as appropriate, including the use of odor-neutralizing agents.

The excavation of solid waste for each alternative includes the following:

- **Alternatives 1, 2, and 3** – These alternatives would include excavation of 31.5 acres of soil and solid waste from the SSWA. Excavation of soil and solid waste from about 21 acres of the SE Pit Refuse Area is optional under these alternatives.
- **Alternative 5** – This alternative would include excavation of approximately 31.5 acres of soil and solid waste from the SSWA.
- **No Action Alternative** – No excavation of old solid waste areas would take place under the No Action Alternative.

There is a potential for odors to be emitted on a short-term, limited basis as a result of excavation activities, but they are expected to be temporary and minor, and would be mitigated. Prior to any waste excavation work under the selected action alternative, KCSWD will prepare a plan for review and approval by Public Health that will include specific terms and conditions for soil and waste excavation and mitigation measures. Continuation of the ongoing odor control program at the CHRLF and additional mitigation, as needed, should keep odor emissions to a minimum. KCSWD has successfully excavated wastes at the landfill and at transfer stations in the past and controlled the associated odors without off-site impacts.

4.2.2 Indirect and Cumulative Impacts

Odor impacts could occur in neighboring communities as a result of CHRLF operations, but they are expected to be temporary and minor. With the ongoing success of the odor management program, such as gas control systems and daily landfill cover, odors are transient in nature and do not cause indirect or cumulative impacts.

4.3 Mitigation Measures

As KCSWD continues to implement the best management practices described in this chapter, no additional mitigation will be necessary to minimize impacts to air and odor in the vicinity of the landfill. KCSWD would install and activate gas collection for each of the action alternatives as soon as possible. Mitigation of odors associated with construction and operations would be accomplished by keeping the working face as small as possible, limiting excavation of old refuse areas, limiting excavation to the cooler parts of the construction season, and using odor-neutralizing agents. Management controls currently in place for mitigating odors would continue to be utilized.

4.4 Significant Unavoidable Adverse Impacts

Significant, unavoidable adverse impacts to air quality, including odor, are not anticipated from implementing any of the alternatives.